IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF SOUTH CAROLINA
CHARLESTON DIVISION

IN RE: AQUEOUS FILM-FORMING FOAMS PRODUCTS LIABILITY LITIGATION	MDL No. 2:18-mn-2873-RMG **This Document relates to ALL CASES**

DEFENDANTS' OMNIBUS MEMORANDUM OF LAW IN SUPPORT OF THEIR MOTION FOR PARTIAL SUMMARY JUDGMENT ON THE FIRST ELEMENT OF THE GOVERNMENT CONTRACTOR IMMUNITY DEFENSE

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INTRODUCTION

Since the 1960s, the Department of Defense has purchased aqueous film-forming foam ("AFFF") from private contractors that manufactured it in accordance with DoD's particularized Military Specifications ("MilSpec"). MilSpec AFFF extinguishes dangerous hydrocarbon fuel-based fires more rapidly and effectively than any available alternative, and it has saved countless military and civilian lives and property likely worth billions of dollars. Because mere seconds can mean the difference between life and death, the government still mandates its use today.

DoD wrote the MilSpec establishing specific parameters for AFFF more than 50 years ago and has amended and revised it a dozen times since. From the very first version of MIL-F-24385 that DoD issued in 1969, the military required MilSpec AFFF to contain "fluorocarbon surfactants." Fluorocarbon surfactants are per- and poly-fluoroalkyl substances ("PFAS"), which are chemicals distinguished by their carbon-fluorine bonds, among the strongest in chemistry. No one disputes that MilSpec AFFF is mission-critical for the military and that its fluorocarbon surfactant components are essential to making the product work as dictated by the MilSpec.

In a substantial majority of the cases in this MDL, Plaintiffs bring claims for injuries they allege were caused by the government's use of MilSpec AFFF. Although Plaintiffs' allegations vary widely, their core allegation appears to be that the fluorocarbon surfactant components of MilSpec AFFF were defective because they contained "long-chain" PFAS (generally featuring a chain of eight or more fluorine-bonded carbons), specifically perfluorooctanoic acid ("PFOA"), perfluorooctane sulfonic acid ("PFOS"), and/or other PFAS that Plaintiffs allege break down into PFOS or PFOA. *See infra* n.3.

The Fourth Circuit and other federal courts have repeatedly held that the government contractor defense ("GCD") set forth in *Boyle v. United Technologies Corp.*, 487 U.S. 500 (1988), shields contractors from liability for damages allegedly caused by products meeting

specifications—like the AFFF MilSpec—that DoD issued to achieve military objectives. Pursuant to CMO No. 16C, this motion addresses only the first element of the GCD: whether the government "approved reasonably precise specifications" for MilSpec AFFF. *Boyle*, 487 U.S. at 512. As this Court has noted, this element of the GCD is not defendant specific. Rather, the sole question is whether the AFFF MilSpec itself is "reasonably precise." Under two independent tests that the Fourth Circuit developed to address the "reasonably precise" element,[1] as a matter of law, the AFFF MilSpec satisfies this first element.

First, the AFFF MilSpec is "reasonably precise" on its face. DoD issued and reissued a military specification for AFFF—continuously for fifty years—in which DoD set out numerous detailed requirements, including that MilSpec AFFF must: contain "fluorocarbon surfactants" (explicitly until 2019, and implicitly thereafter); have certain chemical and physical properties (including properties inextricably connected to the fluorocarbon surfactants in AFFF, such as film formation); and satisfy rigorous standards for fire extinguishment performance that can only be met with certain types of fluorocarbon surfactants. In fact, the only AFFF products that have been able to meet the MilSpec have contained or may break down into some amount of PFOA or PFOS. DoD recognizes this in the current MilSpec itself, which provides that MilSpec AFFF may *still* contain up to 800 ppb (or 800,000 ppt) of PFOA and/or PFOS.

Second, the uncontroverted evidence demonstrates that the government continued to specify, purchase, and use MilSpec AFFF containing PFOA and/or PFOS long after it had investigated and become aware of the very alleged hazards that Plaintiffs claim in these cases.

[1] An MDL court applies the federal law of the circuit in which it is located. *See In re Korean Air Lines Disaster*, 829 F.2d 1171, 1174–76 (D.C. Cir. 1987), *aff'd*, 490 U.S. 122 (1989); *Allen v. Pfizer, Inc.*, 2016 WL 7338595, at *2 (D.S.C. Jan. 15, 2016) (citing *Bradley v. United States*, 161 F.3d 777, 782 n.4 (4th Cir. 1998)). Because the GCD is a federal-law doctrine, Fourth Circuit law controls.

Even today, following years of litigation focused on the alleged hazards of PFOA and PFOS, DoD continues to purchase and use MilSpec AFFF that contains the long-chain PFAS about which Plaintiffs complain.

Under each of these two independently sufficient tests, the AFFF MilSpec satisfies the first element of *Boyle* as a matter of law. Defendants therefore respectfully request that the Court enter partial summary judgment on this *Boyle* factor.

STATEMENT OF THE NATURE OF THE CASE

On December 7, 2018, the Judicial Panel on Multidistrict Litigation created this MDL to centralize cases "alleg[ing] that AFFF products . . . caused the release of PFOA or PFOS." *In re AFFF Prods. Liab. Litig.*, 357 F. Supp. 3d 1391, 1394 (J.P.M.L. 2018). Among the common issues that the JPML identified was Defendants' "government contractor defenses." *Id.* This Court ordered the parties to limit this motion to "the first [*Boyle*] factor of demonstrating government contractor immunity." CMO No. 16C ¶ 1, ECF No. 1950.

LEGAL STANDARDS

I. Partial Summary Judgment Standard.

A party may move for partial summary judgment under Rule 56 to obtain a "pretrial adjudication that certain issues shall be deemed established for the trial of the case." Fed. R. Civ. P. 56 advisory committee's note to 1946 amendment. Like full summary judgment, partial summary judgment should be granted "if the movant shows that there is no genuine dispute as to any material fact and the movant is entitled to judgment as a matter of law." Fed. R. Civ. P. 56(a); *see, e.g.*, *Carlson v. Bos. Sci. Corp.*, 856 F.3d 320, 324 (4th Cir. 2017).

Federal courts, including the Fourth Circuit, regularly affirm summary judgment for defendants on the GCD. *See, e.g.*, *In re Agent Orange Prod. Liab. Litig.*, 517 F.3d 76, 87–102 (2d Cir. 2008) (affirming summary judgment on GCD); *Ramey v. Martin-Baker Aircraft Co.*, 874 F.2d

946, 946 (4th Cir. 1989) (same); *Kleemann v. McDonnell Douglas Corp.*, 890 F.2d 698, 700 (4th Cir. 1989) (same). Summary judgment "serves the useful purpose of disposing of meretricious, pretended claims before the court and parties become 'entrenched in frivolous and costly trial.'" *Richland-Lexington Airport Dist. v. Atlas Props., Inc.*, 854 F. Supp. 400, 408 (D.S.C. 1994) (quoting *Donahue v. Windsor Locks Bd. of Fire Comm'rs*, 834 F.2d 54, 58 (2d Cir. 1987)) (granting defendants summary judgment on GCD).

II. The Government Contractor Immunity Defense preserves the government's exclusive discretion to set requirements for military equipment.

The Supreme Court formally articulated the elements of the GCD in *Boyle v. United Technologies Corp*. The Court held that "the procurement of equipment by the United States is an area of uniquely federal interest," 487 U.S. at 507, and a "state law which holds Government contractors liable for design defects in military equipment does in some circumstances present a 'significant conflict' with federal policy and must be displaced." *Id*. at 512. The GCD thus shields contractors from liability for claims based on alleged defects in products manufactured for the federal government.

The defense derives from the government's own discretionary function immunity, which reaches its apex when a case involves military equipment. *See id.* at 505, 512. This is because in such a case, the federal interest at stake is not just that "the government's 'work' gets 'done,'" but also that a civilian court not interfere in the military's "ability to pursue American military objectives." *In re Agent Orange Prod. Liab. Litig.*, 517 F.3d at 96–97 (quoting *Boyle*, 487 U.S. at 505); *Kleemann*, 890 F.2d at 701.

In this regard, the GCD respects and preserves separation of powers. "The judicial branch is by design the least involved in military matters" and is "ill equipped to make military judgments." *Tozer v. LTV Corp.*, 792 F.2d 403, 405, 408 (4th Cir. 1986). The GCD is essential

to preventing courts and juries from "second-guessing" the military's discretionary procurement decisions, *Boyle*, 487 U.S. at 511, "given the complexities of military decision making and the constitutional delegation of the war powers to the legislative and executive branches," *Ripley v Foster Wheeler LLC*, 841 F.3d 207, 210 (4th Cir. 2016).

Boyle springs from the fundamental principle that it "makes little sense to insulate the Government against financial liability" for a mission-critical product like AFFF "when the Government produces the equipment itself, but not when it contracts for the production." *Boyle*, 487 U.S. at 512. A "higher risk of liability for government contractors would increase costs to the government while decreasing the supply of contractors and research and development in military equipment." *Ripley*, 841 F.3d at 210. Thus, "[a]pplication of ordinary tort law to military design and procurement decisions is not appropriate, for the government 'is required by the exigencies of our defense effort to push technology towards its limits and thereby incur risks'" that may be unacceptable for ordinary consumer goods. *Harduvel v. Gen. Dynamics Corp.*, 878 F.2d 1311, 1316 (11th Cir. 1989) (quoting *Tozer*, 792 F.2d at 406).

III. The first element of the Government Contractor Immunity Defense is met when the government "approved reasonably precise specifications."

In *Boyle*, the Supreme Court held that the GCD immunizes government contractors whenever "(1) the United States approved reasonably precise specifications; (2) the equipment conformed to those specifications; and (3) the supplier warned the United States about the dangers in the use of the equipment that were known to the supplier but not to the United States." 487 U.S. at 512. The Court explained that the first element is intended to "assure that the design feature in question was considered by a Government officer, and not merely by the contractor itself." *Id.* "There are two routes" for contractors to satisfy "the first prong of the *Boyle* test." *Ramey*, 874 F.2d at 950.

As the Fourth Circuit explained in *Ramey*, 874 F.2d at 950, the first test—developed in *Tozer*—examines the totality of the circumstances to determine whether the government established "reasonably precise specifications." *Tozer*, 792 F.2d at 407–08 (citation omitted)). The *Tozer* test does not set a high bar: Contractors can satisfy the test merely by demonstrating "genuine governmental participation in the design" that amounts to more than a rubber stamping. *Id*. at 408. In circumstances like those present here, when the government itself issues a reasonably precise specification for the product, the *Boyle* requirement is satisfied. *Ramey*, 874 F.2d at 950 (holding that *Boyle*'s first element was met when "[t]he Navy issued the original design specifications"); *Carley v. Wheeled Coach*, 991 F.2d 1117, 1125 (3d Cir. 1993) (first *Boyle* element was met "'when the government itself created and approved the specifications'" (citation omitted)).

Boyle also emphasized that a court cannot "penalize" a contractor simply because it participated in the design process and thereby "deter[] active contractor participation in the design process, placing the contractor at risk unless it identifies all design defects." *Boyle*, 487 U.S. at 513. In fact, contractor "participation in design is essential to the development of a military force that is competitively equipped." *Tozer*, 792 F.2d at 407. Thus, because the "design ultimately selected may well reflect a significant policy judgment by Government officials whether or not the contractor rather than those officials developed the design," *Boyle*, 487 U.S. at 512, the GCD does not require the government to set out an exact "recipe" or blueprint for a product. Rather, examples abound where courts have granted summary judgment to contractors that retained discretion over the design of government-specified products.[2]

[2] *See Oliver v. Oshkosh Truck Corp.*, 96 F.3d 992, 999 (7th Cir. 1996) ("Nor does the fact that Oshkosh may have retained some discretion to position the fuel tanks and exhaust system within

As the Fourth Circuit also explained in *Ramey*, 874 F.3d at 950, there is an alternative way to satisfy *Boyle*'s initial requirement: by showing that the government continued to purchase or use a product after it became aware that the product included the allegedly defective feature. *Dowd v. Textron, Inc.*, 792 F.2d 409, 411–12 (4th Cir. 1986) (per curiam); *Ramey*, 874 F.2d at 950–51. This *Dowd* test examines the "length and breadth of the [military's] experience" with the product and "its decision to continue using it." *Dowd*, 792 F.2d at 412. If the government continues using a product "[w]ith knowledge of its alleged design defect," then "the Government approved reasonably precise specifications for that product such that the manufacturer qualifies for the military contractor defense for any defects in the design of that product." *Lewis v. Babcock Indus.*, 985 F.2d 83, 89 (2d Cir. 1993). As with the *Tozer* test, cases using the *Dowd* method of satisfying *Boyle*'s first element are numerous. *See, e.g.*, *Brinson v. Raytheon Co.*, 571 F.3d 1348, 1353–54 (11th Cir. 2009); *In re Agent Orange Prod. Liab. Litig.*, 517 F.3d at 92–97; *Lewis*, 985 F.2d at 89; *Dowd*, 792 F.2d at 412; *Gauthreaux v. United States*, 694 F. Supp. 2d 460, 467 (E.D. Va. 2009).

The Second Circuit's decision in the *Agent Orange* MDL—which, like this case, involved

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the envelope permitted by the specifications, standing alone, defeat the government contractor defense."); *Carley*, 991 F.2d at 1125 ("[T]he government need not deprive the manufacturer of all discretion pertaining to a particular design feature in order for the government contractor defense to apply."); *Glassco v. Miller Equip. Co.*, 966 F.2d 641, 643 (11th Cir. 1992) ("[T]he mere fact that the [government] figures for width and thickness are designated as minimums does not render the specifications imprecise."); *Gauthreaux v. United States*, 694 F. Supp. 2d 460, 466 (E.D. Va. 2009) ("[I]n order for the government's specifications to be 'reasonably precise' under the defense, the government need not detail every single detail that it did not want included in the design."); *Szigedi v. Ensign-Bickford Co.*, 2002 WL 32086774, at *6 (M.D.N.C. July 15, 2002) ("It is necessary only that the government approve, not create, the specifications. . . . However, the government need not deprive the manufacturer of all discretion pertaining to a particular design feature in order for the government contractor defense to apply."), *report and recommendation adopted*, 2003 WL 2003510 (M.D.N.C. Apr. 10, 2003); *Yeroshefsky v. Unisys Corp.*, 962 F. Supp. 710, 718–19 (D. Md. 1997) ("reasonably precise specifications [require] only government approval, not government preparation, of the specifications," and do not require the government to "exercise discretion with regard to the specific feature alleged to be defective").

a chemical product the military designated as mission critical—is particularly instructive. The military purchased the herbicide Agent Orange from private contractors pursuant to certain contractual specifications. 517 F.3d at 83. Plaintiffs alleged that Agent Orange contained trace amounts of dioxin (a cancer-causing chemical that was not set forth in the specifications) as a result of the contractors' manufacturing process. The Second Circuit affirmed summary judgment for the contractors under the GCD, holding that the government continued to order and use the product after it had investigated and become aware of the presence of dioxin and its potential toxicity. *Id.* at 92, 94–95. This was despite the facts that: Agent Orange resembled "off-the-shelf, commercially available herbicides" that featured less potent concentrations of Agent Orange's active ingredients, *id.* at 90; the component chemicals "were not developed for military use in the first instance," *id.* at 91; the government's specifications were "silent regarding the method of manufacture," *id.* at 93; and plaintiffs had alleged that a process existed that could have produced a dioxin-free alternative, *id.* at 93–94. The Second Circuit held that because the Army "examined the toxicology data available to it" and still "continued to order Agent Orange," any "'imposition of liability under state law would constitute a significant conflict with the [g]overnment's decision' that the defoliants used in Vietnam as they were produced by the defendants posed no unacceptable hazard." *Id.* at 95 (alteration in original) (quoting *Lewis*, 985 F.2d at 89).

COMMON UNDISPUTED FACTS

I. MilSpec AFFF is a national security asset that saves lives and safeguards vital military equipment.

The military has long recognized MilSpec AFFF as the "gold standard agent" for fighting fires involving liquid hydrocarbon fuels. Ex. 18 (Farley Dep.) 161:23–162:3, 165:6–12. As the name "aqueous film-forming foam" implies, AFFF is a firefighting foam capable of forming a water-based film beneath a blanket of foam; the film rapidly spreads across the surface of liquid

fuels, extinguishing fires and preventing the fuels from releasing flammable vapors that can reignite. Ex. 17 (Darwin Dep.) 570:19–572:11; *see id.* at 460:19–461:15.

Given the inherently dangerous and often confined spaces in which the military operates, there is no dispute that MilSpec AFFF is a "mission critical product" that protects service members and national security assets like ships, airplanes, and installations essential to national security. *E.g.*, Ex. 23 at 1; Ex. 24 at '970–71; Ex. 17 (Darwin Dep.) 451:17–453:24; Ex. 18 (Farley Dep.) 64:19–65:7; Ex. 22 (Walker Dep.) 338:19–339:10. Military operations place large quantities of highly flammable liquid petroleum fuels in close proximity to aircraft, ordnance, and other hazards. Ex. 30 at '010; Ex. 24 at '970–71. Hard-won lessons from World War II and after taught the military that fast, efficient fire suppression is essential to maintain combat readiness and to protect life and military assets. *See* Ex. 25 at 72–91; *see* Ex. 17 (Darwin Dep.) 455:21–487:10.

The Navy—which DoD designated to write, issue, and oversee the AFFF MilSpec—must approve all MilSpec AFFF products sold to the U.S. military by placing them on a Qualified Products List ("QPL") following the Navy's determination that the products meet the MilSpec's precise qualification tests, Ex. 15 Resps. 18, 20, which establish parameters for "the best flammable liquid firefighting agent for military applications," Ex. 38 at 10. Over the last five decades, the military has extensively deployed MilSpec AFFF on military bases, airfields, and ships worldwide for use in fire suppression, fire prevention, and fire training. Ex. 104 at '273–75. From firefighting following military plane crashes, Ex. 22 (Walker Dep.) 90:22–92:6, to putting out massive fires aboard military vessels, Ex. 17 (Darwin Dep.) 452:23–455:3, MilSpec AFFF has repeatedly proven critical to saving lives, safeguarding military equipment, and achieving military objectives, Ex. 15 Resp. 8; Ex. 17 (Darwin Dep.) 453:1–4. For a striking example, see Ex. 26, in which [redacted]

[redacted] *Id.* (video at timestamp 2:30–35).

II. The Navy developed AFFF in collaboration with private industry.

As far back as the 1940s, the military has been researching fluorocarbon chemistry in collaboration with academics and industry. Ex. 27 at 68; Ex. 28 at 27; Ex. 29 at 367, 374. A fluorocarbon is a chemical that binds fluorine and carbon atoms, creating one of the strongest organic chemical bonds. *See* Ex. 21 (Tetla Dep.) 20:14–18; Ex. 29 at 367.

In the 1950s and 1960s, with devastating shipboard fires in World War II fresh in mind and supercarriers deploying jet aircraft coming online, the Navy actively sought new tools to improve and replace the protein-based foams then available. Ex. 30 at 2–8; Ex. 31 at '094; Ex. 32 at 2–34. The Naval Research Laboratory ("NRL") led this research. Ex. 30 at 2–8; Ex. 27 at 67–78. Of particular interest to NRL were fluorocarbons' capabilities to form films over liquid hydrocarbon surfaces. Ex. 32 at 5–6; *see* Ex. 28 at 27, 110–11.

In the early 1960s, "[a]n involved study and testing program" at NRL led to the "discovery and development" of AFFF, which NRL itself initially named "Light Water" because it formed an aqueous layer that appeared to float on a fuel surface. Ex. 32 at 38, 43. During this period, NRL sourced a variety of fluorosurfactants from 3M for testing as potential fire-extinguishing agents. Ex. 30 at 21; Ex. 32 at 35 ("A concentrated form of the mixture of surfactants found most effective . . . is supplied by [3M] according to NRL recommendations."); *see also* Ex. 32 at 7–13. After testing numerous fluorocarbon materials, NRL identified an initial AFFF formulation that proved effective. Ex. 30 at 21 (noting that early AFFF "concentrates had been manufactured according to a formulation set down by NRL"); *see also* Ex. 32 at 8–9; Ex. 33 at '071–79. This research, development, and use occurred before AFFF was used for civilian applications. *See* Ex. 34 at 2. NRL has taken credit for the "development" of AFFF ever since. Ex. 35 at 1; *see* Ex. 36 at '903–04; Ex. 37 at 44–45.

In 1963, NRL scientists applied for a patent related to AFFF; the application disclosed in detail the fluorocarbon ingredients used in early AFFF formulations. *See* Ex. 31 at ’093–120; Ex. 30 at 11–12; Ex. 38 at 8. The Navy identified these “fluorocarbon compounds” as “derivatives of” PFOA (the “perfluorocarboxylic . . . acid[]” in which the “perfluoroalkyl chain” is “C_7F_{15}”) and PFOS (the “perfluorosulfonic acid[]” in which the “perfluoroalkyl chain” is “C_8F_{17}”). *See* Ex. 31 at ’094–95; *see also id.* at ’098–120.[3] In 1966, that application resulted in a method patent granted to the Navy for extinguishing liquid hydrocarbon fires with AFFF. Ex. 31 at ’093–97. Following its initial formulations of AFFF in the early 1960s, NRL continued to work with 3M and others in the industry to further develop and test AFFF to meet the military’s needs. Ex. 30 at 14–15, 21; Ex. 27 at 68; Ex. 42 at 1–4; Ex. 38 at 8–10; Ex. 43 at 62–63.

The Navy intensified its AFFF development efforts after a July 1967 catastrophe on the aircraft carrier USS *Forrestal*. Ex. 17 (Darwin Dep.) 465:21–25, 472:24–473:23; Ex. 27 at 68. During combat operations off the coast of Vietnam, a rocket misfired across the flight deck, rupturing another aircraft’s fuel tank and spreading flaming jet fuel across the crowded deck. Ex. 25 at 76; Ex. 17 (Darwin Dep.) 467:19–23. Within seconds, that fire detonated ordnance loaded on nearby aircraft. Ex. 25 at 76. Explosions triggered more explosions, and the fire quickly ran out of control, ripping holes in the flight deck that allowed burning fuel to pour into the lower

[3] PFOS ($C_8F_{17}SO_3H$) and PFOA ($C_7F_{15}CO_2H$) are two specific types of “C8” or eight- carbon-molecule PFAS that contain a chain of carbon atoms connected to a sulfonic acid and carboxylic acid functional group, respectively. In addition to the Navy’s disclosures in its 1963 patent application, other government documents from the 1960s forward demonstrate that the government knew that AFFF products contained long-chain fluorosurfactants (such as PFOS and PFOA) and understood their chemical structure. *See, e.g.*, Ex. 39 at ’877, ’888; *see also* Ex. 40 at 2; Ex. 41 at 2; Ex. 76 at 2; Ex. 74 at 3. Those include reports prepared for the Air Force in the 1990s by Defendant Dynax outlining the chemicals’ carbon-chain lengths and chemical formulas. *See, e.g.*, Ex. 22 (Walker Dep.) 474:7–475:3; Ex. 93 at ’816; Ex. 94 at 108; Ex. 19 (Nelson Dep.) 137:19–138:14; *see also* Ex. 94 at 32, 108; Ex. 22 (Walker Dep.) 524:13–525:25. *Compare* Ex. 90 at ’449, *with* Ex. 94 at 13.

decks. All told, the conflagration killed 134 sailors, seriously injured 300 more, destroyed 21 military aircraft, and took a national security asset (the *Forrestal*) out of action for months. *Id.*; Ex. 17 (Darwin Dep.) 454:3–7, 467:12–23. The non-AFFF protein foams then in use on Navy ships could not extinguish the fires rapidly enough to prevent extensive loss of life and damage to the ship and aircraft. Ex. 30 at 5, 24; Ex. 25 at 42.[4] Against the backdrop of the *Forrestal* tragedy and other catastrophic fires, NRL drafted the 1969 AFFF MilSpec. *See* Ex. 1 (1969 MilSpec).

III. Since 1969, the AFFF MilSpec has set numerous precise requirements for MilSpec AFFF purchased and used by the military.

Military specifications embody DoD's discretionary judgment on requirements for products purchased and used by the military. *See* Ex. 44 at ii–xiv. MilSpecs allow DoD to procure such goods through a competitive marketplace from private manufacturers rather than make them itself. Ex. 15 Resp. 17.

Because of AFFF's superior firefighting performance, the Navy began to convert all U.S. Naval Air Stations to freshwater-compatible AFFF in the late 1960s. Ex. 30 at 22–23. In 1969, shortly after NRL tested and approved a seawater-compatible AFFF formulation (and on the heels of the *Forrestal* disaster and a similar fire on USS *Enterprise*), the Navy issued the MilSpec for AFFF, designated as MIL-F-24385. Ex. 25 at 76; Ex. 17 (Darwin Dep.) 131:12–19; Ex. 1 (1969 MilSpec).[5] Around 1970, the military began purchasing and using 3M's MilSpec AFFF, which used fluorocarbon surfactants made through a process called "electrochemical fluorination." Ex. 99 at 2. The remaining MilSpec AFFF manufacturers use fluorocarbon surfactants made through a process called "telomerization." The military began purchasing and using such telomer-based

[4] *See also Trial By Fire: A Carrier Fights for Its Life*, *available at* https://tinyurl.com/d3rm3npp; Ex. 17 (Darwin Dep.) 465:11–20, 468:16–23; Ex. 18 (Farley Dep.) 176:4–11.

[5] MIL-F-24385 superseded the original 1963 MilSpec for AFFF (MIL-F-23905), which the Navy had not approved for seawater use. Ex. 15 Resps. 3, 6; Ex. 14 (1963 MilSpec).

MilSpec AFFF from certain manufacturers no later than 1973, when the military first approved it for listing on the QPL. *See id*. at 1–2.

The Air Force converted to MilSpec AFFF in the early 1970s. Ex. 17 (Darwin Dep.) 508:3–509:10; Ex. 22 (Walker Dep.) 77:2–17. Since then, all branches of the military have adopted MilSpec AFFF. Ex. 25 at 42; *see* Ex. 30 at 33. Because civilian airports pose risks similar to those at military airfields, the Federal Aviation Administration also requires MilSpec AFFF at most passenger airports. *See* Ex. 45 at 4; Ex. 46 at 25–26.

Naval Sea Systems Command and its predecessor agencies (collectively, "NAVSEA") have written, issued, and administered the AFFF MilSpec on behalf of DoD. Ex. 15 Resp. 7; *see* Ex. 34 at 2. NAVSEA, in turn, looks to NRL for technical guidance, testing, and expertise on the MilSpec, and NRL recommends revisions to NAVSEA for approval and promulgation. *See, e.g.*, Ex. 34 at 2; Ex. 17 (Darwin Dep.) 639:13–22, 647:21–648:3, 650:22–651:8, 985:20–23; Ex. 18 (Farley Dep.) 57:7–58:23, 217:20–218:12.

NAVSEA has amended or revised the MilSpec a dozen times between 1969 and 2020. Exs. 1–13 (AFFF MilSpecs, including amendments and revisions). A current version of MIL-F-24385—now denoted MIL-PRF-24385F(SH)—continues to specify the requirements for MilSpec AFFF today. Ex. 13 (2020 MilSpec).

The MilSpec imposes rigorous requirements for materials, chemical and physical properties (including properties relating to potential environmental impact and toxicity), fire performance, and packaging and markings. Exs. 1–13 (1969 to 2020 MilSpecs) § 3; *see also* Ex. 38; Ex. 47 at 23–26; Ex. 48 at 28–31; Ex. 136 at '009–10. Together, these requirements establish the "gold standard for AFFF, a much more rigid test" than private industry standards place on commercial AFFF. Ex. 17 (Darwin Dep.) 391:4–6; Ex. 49 at A-4 ("'MIL-SPEC' AFFF

concentrate is the standard by which others are measured.").

For half a century—from the 1969 MilSpec until the 2019 revision—the text of the MilSpec explicitly required contractors to use "fluorocarbon surfactants" in the product. Ex. 15 Resp. 33. For these 50 years, the MilSpec "Scope" covered "aqueous film forming foam (AFFF) liquid concentrate fire extinguishing agent, *consisting of fluorocarbon surfactants*." Exs. 1–11 (1969 to 2017 MilSpecs) § 1.1 (emphasis added); *see* Ex. 17 (Darwin Dep.) 570:19–572:11. Under "Requirements" for "Materials," the military mandated that MilSpec AFFF "*shall* consist of fluorocarbon surfactants plus other compounds as required to conform to the requirements specified hereinafter." Exs. 1–11 (1969 to 2017 MilSpecs) § 3.2 (emphasis added). The word "shall," in the military as in the law, denotes a mandatory requirement. Ex. 44 at iii; Ex. 17 (Darwin Dep.) 569:21–570:18. Thus, "fluorocarbon surfactants" have always been the linchpin of AFFF's performance capabilities.

The military has constrained the types of fluorocarbon surfactants that contractors may use through stringent requirements, rather than through "recipes" or specific formulas. For example, the MilSpec requires that qualified AFFF products be able to form a film on a specific reference fuel (cyclohexane). *See, e.g.*, Ex. 1 (1969 MilSpec) §§ 3.10, 4.7.7; Ex. 13 (2020 MilSpec) §§ 3.3.1, 4.7.6; Ex. 18 (Farley Dep.) 426:12–427:3. Film formation in turn aids MilSpec AFFF's superior fire performance, which the MilSpec separately tests and defines in terms of the maximum amount of time (in seconds) in which MilSpec AFFF must extinguish several types of hydrocarbon fuel fires. *See, e.g.*, Ex. 15 Resp. 25; Ex. 1 (1969 MilSpec) §§ 3.11, 4.7; Ex. 13 (2020 MilSpec) § 3.4; Ex. 17 (Darwin Dep.) 570:19–572:11. Fluorocarbon surfactants are not interchangeable; only certain fluorosurfactants can be used to meet the MilSpec, and substituting one fluorocarbon surfactant for another can significantly change the resulting AFFF's performance. *See* Ex. 138 at

'725.

Over the years, the Navy also has tightened the required extinguishment times to provide an even greater margin of safety to military personnel and equipment. Ex. 22 (Walker Dep.) 335:14–340:8; Ex. 18 (Farley Dep.) 64:9–25. Today, for example, MilSpec AFFF must extinguish a 28-square-foot fire within 30 seconds. Ex. 13 (2020 MilSpec) § 3.4. These are the most stringent requirements in the world for rapidly extinguishing hydrocarbon fuel-based fires. *See* Ex. 24 at '971; Ex. 47 at '887. And for good reason: As illustrated by the *Forrestal* disaster, military operations often involve weapons that, if exposed to fire, can explode in under a minute. Ex. 90 at '436; Ex. 17 (Darwin Dep.) 457:21–458:14. [redacted]

A related MilSpec requirement involves "burnback," which measures how long a static blanket of MilSpec AFFF will prevent the underlying fuel from reigniting. Ex. 20 (Sheinson Dep.) 55:3–56:8; *see* Ex. 13 (2020 MilSpec) §§ 4.7.13.1.4, 4.7.13.2.5 (burnback test requirements). As with other requirements, the military has lengthened the minimum burnback time of 240 seconds in the initial MilSpec to 360 seconds today. Ex. 1 (1969 MilSpec) § 3.11.1; Ex. 13 (2020 MilSpec) § 3.4. This means that a static blanket of MilSpec AFFF must be able to suppress reignition for *six minutes*, simply sitting on top of the previously burning fuel and with no firefighter intervention, a 50% improvement from the original requirement of four minutes.

Burnback resistance is a critical feature because it suppresses the toxic, flammable vapors previously-burning fuel emits and thereby permits military firefighters to enter what seconds earlier was an inferno in order to rescue personnel, remove hazardous equipment, and secure materials that could exacerbate a fire should it reflash. *See* Ex. 22 (Walker Dep.) 328:25–330:2.

In fact, AFFF is so effective at preventing burnback that as a firefighter walks through a pool of fuel, the film formed by AFFF will "reheal[]" (close up) behind her, ensuring that the fire will not reflash behind her and trap her and other personnel in the fire area. *See id.*

In sum, the MilSpec indisputably expresses the military's discretionary judgment that MilSpec AFFF must be made with fluorocarbon surfactants that have specific properties and capabilities. Ex. 17 (Darwin Dep.) 568:6–570:18, 575:4–575:20. That is, if an AFFF contained a fluorocarbon surfactant but did not pass *every other requirement*, it would not qualify under the MilSpec. *See* Ex. 18 (Farley Dep.) 216:20–24; Ex. 20 (Sheinson Dep.) 44:3–47:4. Conversely, from 1969 to 2019 when the MilSpec contained the express requirement for "*fluorocarbon* surfactants," even if a particular AFFF product could pass every other requirement of the MilSpec, if it did not contain a fluorocarbon surfactant, it would not qualify. *See* Ex. 18 (Farley Dep.) 216:20–24; Ex. 136 at '010.

In May 2019, well after this litigation began, the government amended the AFFF MilSpec by deleting the word "fluorocarbon" before the word "surfactant" in paragraphs 1.1 and 3.2. Ex. 12 (2019 MilSpec) §§ 1.1, 3.2. But this change made no difference: It is undisputed that, to this day, a *fluorocarbon* surfactant remains necessary to meet the requirements of the AFFF MilSpec. Ex. 15 Resps. 37, 42; Ex. 18 (Farley Dep.) 233:17–234:10 (NRL Director of Fire Test Operations noting that at the time of this change he "[knew] full well that the performance would not change because there is no other film-forming agent that we know of yet that can meet the mil spec requirement"); *see* Ex. 18 (Farley Dep.) 372:4–15 (fluorine-free foams do not form films on cyclohexane). As one 1996 Navy document puts it, because fluorocarbon surfactants "enable AFFF solutions to form a film on a fuel surface," they are the "sine qua non of AFFF formulations: *without fluorocarbon surfactants, there can be no AFFF*." Ex. 50 at 5 (emphasis added); *see also*

Ex. 22 (Walker Dep.) 328:1–330:2.

In fact, starting in 2017, the government expressly acknowledged this reality in the text of the MilSpec, noting that although the "DoD's goal is to acquire and use a non-fluorinated AFFF formulation or equivalent firefighting agent to meet the performance requirements for DoD critical firefighting needs," "*a viable solution may not be found for several years.*" Ex. 11 (2017 MilSpec) § 6.6 (emphasis added). Both the 2019 and 2020 versions contain the same provisions. Ex. 12 (2019 MilSpec) § 6.6; Ex. 13 (2020 MilSpec) § 6.6.

As the Deputy Assistant Secretary of Defense for Environment put it in a statement to Congress in 2018, "[t]here is currently no fluorine-free formulation of the foam commercially available that meets the critical [MilSpec] requirement to suppress aircraft fires effectively." Ex. 51 at 53; *see also id.* at 7. In May 2019, just after the government amended the MilSpec, the Director of Fire Test Operations at NRL—who oversees testing that qualifies MilSpec AFFF products—explained to an Assistant Secretary of the Navy that removal of the word *fluorocarbon* was a "political move since finding an acceptable film forming product without the use of fluorine is very unlikely." Ex. 52 at '463. Even state-of-the-art fluorine-free foams today "are not film-forming" and therefore cannot satisfy the current MilSpec's requirements. Ex. 18 (Farley Dep.) 209:3; *see id.* at 199:25–200:12, 208:18–209:5, 246:11–247:15, 372:4–15, 377:20–378:13.

The MilSpec's various requirements have driven AFFF formulations in another way: The fluorocarbon surfactants capable of meeting the MilSpec have always contained some amount of long-chain fluorosurfactants, including PFOS or PFOA or compounds with the potential to degrade into PFOS and/or PFOA. Such compounds were present either by virtue of their primary use in ECF-based fluorocarbon surfactants or, as is now known, by virtue of their presence as an unintended byproduct of the manufacturing process for certain telomer-based fluorocarbon

surfactants. *See, e.g.*, Ex. 136 at ’008–09. This was true from the original AFFF formulations, as reflected in the Navy’s patent in the 1960s, which described AFFF with fluorocarbon surfactants specifically derived from long-chain fluorosurfactants (including PFOS and PFOA). Ex. 31 at ’094–95; *see also* Ex. 33 at ’076–78 (1963 NRL laboratory report [redacted]). It is true today as well. After decades of research and development driven by the evolving needs of the U.S. military, the fluorocarbon surfactant compositions that meet the MilSpec’s requirements continue to require fluorocarbon surfactants that “may contain trace amounts of PFOS and/or PFOA.” Ex. 15 Resp. 43.

The 2017 MilSpec (and later amendments) also expressed the government’s view on the inevitable presence in AFFF of PFOA or PFOS and placed limits on those two compounds. In that MilSpec, NAVSEA imposed the first limits on the PFOS and PFOA content of MilSpec AFFF, setting them at 800 parts per billion (which equates to 800,000 parts per trillion). *See, e.g.*, Ex. 11 (2017 MilSpec) § 4.7.8 & tbl. I; Ex. 13 (2020 MilSpec) § 4.7.8 & tbl. I. NAVSEA “has complete discretion to have set [the PFOS/PFOA limit] at zero if [it] wanted to.” Ex. 17 (Darwin Dep.) 945:6–11. But it did not, exercising instead its discretionary judgment “to acquire and use AFFF with the lowest demonstrable concentrations” of PFOA and PFOS. Ex. 11 (2017 MilSpec) § 6.6; Ex. 13 (2020 MilSpec) § 6.6.

In summary, for a half century the military has exercised—and continues to exercise—its discretion to balance potential hazards associated with fluorocarbon surfactants that contain and/or may degrade to PFOS and PFOA against the risks to personnel and materiel from fire hazards. The military mandated the use of fluorocarbon surfactants and even today chooses products “meeting all other military specification requirements” that “contain trace amounts of PFOS and/or

PFOA" over the available non-fluorinated products that fail to meet MilSpec requirements. Ex. 15 Resps. 33, 37, 43; *see* Ex. 18 (Farley Dep.) 267:4–9; Ex. 138 at '725; Ex. 13 (2020 MilSpec) § 6.6.

IV. The government has continuously investigated the alleged hazards of MilSpec AFFF's fluorocarbon surfactant components.

The military has investigated potential risks associated with fluorocarbon surfactants in AFFF, including potential risks to the environment and human health, for many years. Throughout these decades of study, the government has consistently opted to continue using and purchasing MilSpec AFFF. It still does so today.

A. The government has thoroughly examined potential risks posed by the fluorocarbon surfactants used to meet the MilSpec.

The government has long understood that the superior firefighting capabilities of MilSpec AFFF, derived from its use of particular types of fluorocarbon surfactants and other chemicals, come with potential risks. Having examined those potential risks and decided how to balance those risks in setting the requirements of the AFFF MilSpec, the government has continued to use and purchase defendants' AFFF products to this day.

1. *Biodegradability/Persistence.* The persistence and stability of fluorocarbon chemicals were well established long before the initial development of AFFF. *See, e.g.*, Ex. 29 at 367 (1947 article from War Research Laboratories researchers noting "stability of the C-F bond" and fluorocarbons' "great chemical inertness and resistance to oxidation"); Ex. 54 at 310 (1967 fluorine chemistry textbook stating that "there are no known biological organisms that are able to attack the carbon-fluorine bond in a fluorocarbon"); Ex. 18 (Farley Dep.) 383:23–384:2 (acknowledging carbon-fluorine bond is among the strongest); Ex. 136 at '008 ("fluorosurfactants . . . are environmental[ly] persistent as a class"). In fact, this is a fundamental and essential *feature* of the specific fluorocarbon surfactants that compose MilSpec AFFF. As the

Navy's patent recognized in the 1960s, AFFF works precisely because "the present fluorocarbons," i.e., fluorocarbon surfactants derived from long-chain chemistry like PFOA and PFOS, "possess the necessary thermal and chemical stability which is essential for foam compositions." Ex. 31 at '095; *see supra* p. 11 (discussing patent disclosures). Without these properties, AFFF would not work in the first place.

This persistence and stability also mean that the fluorocarbon surfactant component of AFFF resists biodegradation, a fact the government has understood since at least the 1970s. Ex. 55 at 78–79 (1974 Air Force study on AFFF waste treatment stating that "[t]he fluorocarbon surfactant [in AFFF] . . . is at best only partially biodegradable"); *see* Ex. 56 at 1 ("The organic constituents present in AFFF have been reported to resist biodegradation . . . ."); Ex. 57 at 3 ("The fluorochemical surfactants . . . have long been known not to biodegrade completely."); Ex. 58 at 2, 17 (1978 Navy report on AFFF wastewater that discusses fluorocarbon component's stability and "high resistance to biodegradation"); *see also*, *e.g.*, Ex. 59 (1971 Air Force report of biodegradability and toxicity of 3M AFFF); Ex. 60 (1975 Air Force report on biodegradability and toxicity of Ansul AFFF); Ex. 61 (1985 Navy report on AFFF toxicity); Ex. 62 (1973 Air Force report on biodegradability and toxicity of National Foam AFFF); Ex. 63 (1979 NRL report on AFFF biodegradability and toxicity); Ex. 17 (Darwin Dep.) 959:3–962:18. In NRL's words in 1996, "until another solution can be found, we will have to live with the fact that a small part of the AFFF concentrate"—specifically AFFF's "essential" "fluorocarbon surfactants"—"is non-biodegradable." Ex. 50 at 5.

The government addressed the acknowledged non-biodegradability of these fluorocarbon surfactants in MilSpec AFFF in two ways. First, from the 1970s on, it has devoted significant research and development resources to understanding the potential environmental impact of AFFF

wastewater and to developing treatment strategies for wastewater and groundwater affected by AFFF. *See, e.g.*, Ex. 55 (1974 AFFF wastewater treatment study); Ex. 58 at 17 (1978 Navy report on AFFF wastewater, including biodegradability and toxicity, that notes "AFFF wastewater . . . allowed to percolate into the ground . . . may create a significant effect on . . . ground water contamination"); Ex. 64 at iii (1997 Navy memo: "In the past two decades, [DoD] has devoted considerable resources towards treatment and disposal of AFFF wastewater."); Ex. 65 at 1, 5 (1980 Navy memo noting that AFFF imposes "significant adverse effects/toxicity to the receiving environment" and "[t]he Navy and Air Force are facing this significant pollution abatement problem without a satisfactory solution"); *see also* SERDP-ESTCP, *DoD-Funded Research on PFAS*, https://tinyurl.com/2t2wnh5p (summary of completed and ongoing DoD-funded PFAS-related research since 2011).

Second, the 1978 MilSpec and all versions thereafter have included specific requirements (and accompanying testing protocols) for the overall biodegradability of MilSpec AFFF products. Ex. 15 Resps. 31, 32; Ex. 63 at 7 (1979 NRL report noting that MilSpec was "revised" "[a]s a result of" NRL biodegradability and toxicity research); *see also, e.g.*, Ex. 4 (1978 MilSpec) §§ 4.7.13; Ex. 13 (2020 MilSpec) § 4.7.12.3. The MilSpec has never required that an AFFF product or any of its particular components (let alone all of them) be 100% biodegradable. Rather, the Navy deems an AFFF composition sufficiently "biodegradable" based on the product's "BOD/COD" ratio[6] as set by the MilSpec. *See* Ex. 17 (Darwin Dep.) 959:3–961:2. It has been

[6] "The BOD [biological oxygen demand] measures the amount of oxygen consumed by microorganisms in breaking down a hydrocarbon. The COD [chemical oxygen demand] measures the maximum amount of oxygen that could theoretically be consumed by microorganisms. Therefore, a BOD/COD ratio is representative of the ability of the microorganism to biodegrade the components in a foam. The higher the BOD/COD ratio, the more biodegradable the foam." Ex. 90 at '439–40.

understood since the 1970s that the required BOD/COD ratio would not mean that the fluorocarbon surfactants would fully degrade. *See* Ex. 55 at 78–79. In fact, NAVSEA has exercised its discretion to establish a biodegradability requirement for MilSpec AFFF that is less stringent today than when NAVSEA initially adopted the BOD/COD requirement in 1978. *Compare* Ex. 4 (1978 MilSpec) tbl. I (setting BOD/COD requirement of 0.85) *with* Ex. 13 (2020 MilSpec) tbl. I (setting BOD/COD requirement of 0.65).

2. *Toxicity.* The government has also long studied the potential toxicity of MilSpec AFFF and its fluorocarbon surfactant components. For example, from 1971 on, Air Force researchers conducted myriad studies on the potential toxicity of MilSpec AFFF and experimented with AFFF-wastewater treatment technologies. *See, e.g.*, Ex. 59 (1971 Air Force report on biodegradability and toxicity of 3M AFFF); Ex. 62 (1973 Air Force report on biodegradability and toxicity of National Foam AFFF); Ex. 66 (1974 Air Force report on biodegradability and toxicity of 3M AFFF); Ex. 55 (1974 Air Force study about toxicity and treatment of AFFF wastewater with activated carbon); Ex. 60 (1975 Air Force report on biodegradability and toxicity of Ansul AFFF). The Navy conducted its own research into the potential toxicity of MilSpec AFFF with a focus on saltwater marine life in 1985 and reported similar findings to those of the Air Force. Ex. 61 at 1 ("These foams are potentially toxic due to the fluorocarbons and surfactants."); *see generally id.* at 1–17 (collecting dozens of toxicity data points and reporting additional experimental findings); *see also* Ex. 58 (1978 Navy report on AFFF wastewater including biodegradability and toxicity); Ex. 63 (1979 NRL report on AFFF including biodegradability and toxicity).

Since at least the 1970s, military researchers have also analyzed the fluorocarbon materials associated with MilSpec AFFF for potential health effects in mammals. *E.g.*, Ex. 63 at 5 (1979 NRL report noting conclusion that AFFF "toxicity was related to the [fluorocarbon and

hydrocarbon] surfactants rather than the solvent"); Ex. 76 (1983 Air Force PFAS rat toxicity report). From 1981 to 1995, the Air Force conducted and/or sponsored numerous such studies, some in support of a project on "Occupational and Environmental Toxic Hazards in Air Force Operations" (using animal study results to postulate toxicity in human populations).[7] These included studies investigating both PFOA and another PFAS compound, alternatively called perfluorodecanoic acid ("PFDA") or nonadecafluoro-n-decanoic acid ("NDFDA"), which the Air Force studies identified as a "model compound for evaluating the health hazard associated with use of polyfluorinated chemicals as film forming foam fire extinguishants." Ex. 78 at 1; *see also* Ex. 76 at 2; Ex. 75 at 2.

These studies specifically considered the potential for human health effects from exposure to fluorocarbon materials like those used or found in MilSpec AFFF. For instance, a 1982 study concluded that "perfluoro acid derivatives . . . may be potentially hazardous to the Air Force and the public's health." Ex. 74 at '286. Studies from the 1980s and 1990s continued investigating the possible effects of PFAS exposure on rats and other mammals[8] and some of this same research

[7] *See, e.g.*, Ex. 73 (1981 Air Force rat teratogenicity study of "model perfluorinated acid . . . structurally related to a surfactant agent used in fire retardant foams by the Air Force"); Ex. 74 at '286 (1982 Air Force-sponsored rat toxicity study of "model perfluorinated acid which closely mimics a . . . flu[o]rochemical surfactant which is used by the Air Force in foams of fire extinguishers"); Ex. 75 (1983 Air Force PFAS rat toxicity study); Ex. 76 (1983 Air Force PFAS rat toxicity study); Ex. 77 (1983 published article by Air Force researchers comparing acute toxicity of PFOA to PFDA in rats); Ex. 78 (1984 Air Force-sponsored PFAS rat toxicity study); Ex. 79 (1985 Air Force-sponsored study examining, inter alia, toxicity of PFOA in mouse cells); Ex. 80 (1990 Air Force-sponsored rat toxicity study comparing PFDA and PFOA in rats); Ex. 81 (1993 Air Force-sponsored study of comparative enzyme induction and hepatotoxicity of PFOA in rats and guinea pigs); Ex. 82 (1995 Air Force-sponsored report of comparative PFAS rat toxicity studies).

[8] *See, e.g.*, Ex. 74 at '284, '286; Ex. 84 at 46–52 (2016 Air Force summary of health studies from 1981–1995); Ex. 73 (1981 Air Force PFAS rat teratogenicity report); Ex. 86 at '304–05, '312 (1982 Air Force-sponsored dissertation comparing PFAS effects in rats); Ex. 88 at 4 (1983 Air Force-sponsored PFAS rat study); Ex. 76 (1983 Air Force PFAS rat toxicity study); Ex. 78 at 2–3, 5

recognized the potential of fluorocarbon surfactants related to MilSpec AFFF to bind to human blood.[9] Another example is a 1997 NRL report that discussed "persistence and biodegradability of chemicals in foam . . . *including potential toxicity to humans*" as a factor in the overall "impact of foam on the environment." Ex. 90 at '439 (emphasis added). Mr. Farley, who worked with NRL, testified that he was familiar with this report and acknowledged the Navy's awareness of the "potential" toxicity to humans at this time. Ex. 18 (Farley Dep.) 380:25–382:6.

As with biodegradation, the government exercised its discretion based on these investigations into the potential toxicity of fluorocarbon surfactants in MilSpec AFFF in two ways. First, the military set MilSpec toxicity requirements: Since 1977, all versions of the AFFF MilSpec have included testing protocols and maximum levels for toxicity, reflecting the government's discretionary determination that some level of toxicity is acceptable to meet the military's needs. Ex. 63 at 7 (1979 NRL report noting that MilSpec was "revised" "[as] a result of" NRL biodegradability and toxicity research); *see* Ex. 15 Resp. 30; *see also, e.g.*, Ex. 3 (1977 MilSpec) §§ 3.16, 4.7.16; Ex. 13 (2020 MilSpec) § 4.7.12.1 & tbl. I. The toxicity tests mandated by NAVSEA have evolved over time, but generally set minimum lethal concentration levels for half

(1984 Air Force-sponsored report on PFAS rat toxicity); Ex. 77 (1983 published article by Air Force researchers on acute toxicity of PFOA in rats); Ex. 83 (1985 Air Force-sponsored publication on PFAS effects in rats); Ex. 79 (1985 Air Force-sponsored report on PFAS comparative toxicity in mouse cells); Ex. 89 at 8 (1985 Air Force-sponsored research on PFAS effects on rat cells); Ex. 85 at 512 (1992 PFOA and PFDA rat toxicology publication with Air Force co-author); Ex. 81 (1993 Air-Force sponsored report on PFAS comparative toxicity to rats and guinea pigs); Ex. 87 at 1 (1993 Air Force-sponsored PFAS rat toxicity study); Ex. 82 at 10–17 (1995 Air Force-sponsored report of comparative PFAS rat toxicity studies).

[9] Ex. 86 at '314–16 (1982 Air Force-funded study regarding potential PFAS toxicity, noting the use of PFAS in AFFF and recognizing that PFOA's propensity for "avid binding" to human blood "was reported in the 1950's" (citing Ex. 71)). Another published study similarly reported in 1980 that fluorocarbons may be retained in the body and "very slowly eliminated in humans." Ex. 68 at '106–07 (F.A. Ubel, et al., *Health Status of Plant Workers Exposed to Fluorochemicals*, Am. Indus. Hygiene Assoc. J (1980)); *see* Ex. 67 (letter submitting Ex. 68 to EPA); Ex. 69 (EPA status report referencing Ex. 68); Ex. 70 (letter from NIOSH director to lead author of Ex. 68).

of a population ("LC_{50}") of a particular species of fish, the killifish (*fundulus heteroclitus*), that are exposed to MilSpec AFFF concentrates. Ex. 50 at 3; Ex. 3 (1977 MilSpec) §§ 3.16.1, 4.7.16; Ex. 13 (2020 MilSpec) § 4.7.12.1 & tbl. I.

AFFF products must meet these government-prescribed limits for toxicity to be listed on the QPL. Ex. 18 (Farley Dep.) 58:3–23; Ex. 90 at '440. As Robert Darwin[10] put it, if a MilSpec AFFF did not meet the environmental "requirements set forth in the [MilSpec]," then "they wouldn't have been on the qualified products list." Ex. 17 (Darwin Dep.) 652:8–17.

Second, the military actively sought to develop a less toxic AFFF, including by soliciting development of lower-fluorine or fluorine-free alternatives. For example, in the 1970s, NRL retained Ansul to "explore the development of experimental AFFF formulations that would exhibit reduced impact on the environment while retaining certain fire suppression characteristics." Ex. 91 at '033; *see* Ex. 92 (Ansul Final Report). By 1993, the Air Force had formed the AFFF Interagency Steering Group with the Navy, Army, and FAA to explore the development of more "environmentally-friendly" AFFF. Ex. 22 (Walker Dep.) 445:12–447:2. That same year, the Air Force offered a grant for research on "environmentally more benign" firefighting foams. Ex. 93 at '814; Ex. 19 (Nelson Dep.) 97:3–99:13. The Air Force awarded the grant to Dynax, a small research and development company, which submitted reports to the Air Force from 1993 to 1996 on its research into "environmentally more benign" AFFF. *E.g.*, Ex. 93; Ex. 94. Notwithstanding these efforts, the then-custodian of the MilSpec testified that he "[d]id not" receive "a recommended change to the [MilSpec] from the Air Force as a result of [the program]." Ex. 17 (Darwin Dep.) 546:9–13.

[10] From 1985 to 1998, Mr. Darwin was the custodian of the MilSpec, meaning he was the Navy official charged with maintaining and, when necessary, updating the MilSpec. Ex. 17 (Darwin Dep.) 30:7–31:12, 648:4–12.

In 1995, NAVSEA's Robert Darwin and Joseph Gott of Naval Facilities Engineering Command (which manages engineering and other issues for Navy shore facilities worldwide), among others, neatly summarized the military's large body of knowledge in their article "Foam and the Environment: A Delicate Balance." Ex. 95. They outlined concerns "about the potentially adverse impact of foam discharges on the environment, particularly those that reach natural or domestic water systems" (i.e., contact points with humans and other biota). *Id.* at '662. The paper noted that fluorocarbon surfactants in AFFF are persistent, are not known to fully biodegrade, are mobile in the environment, can move through aquatic systems and leach into soil, may reach ground and surface water, and may "have an affinity for living systems" (i.e., may bioaccumulate in living organisms). *Id.* at '666. The paper also stated that "[i]t is prudent to evaluate the drinking water supply if a foam discharge has contaminated it." *Id.* Yet, even considering all of these known risks, the authors made the judgment that, on balance, "the fire safety advantages of using [AFFF] are greater than the risks of potential environmental problems." *Id.* at '663.

Hence, in the decades leading up to 2000, the government repeatedly investigated potential hazards of MilSpec AFFF and its fluorocarbon surfactant components. The government used this research to understand and manage risks associated with MilSpec AFFF, including by revising the MilSpec to include biodegradability and toxicity requirements and conducting extensive research into wastewater treatment and development of alternative formulations.

B. The government continued its evaluation of MilSpec AFFF's potential hazards following 3M's exit from the market in 2000.

On May 16, 2000, EPA and 3M announced the phase-out of 3M products made with "perfluorooctanyl sulfonate (PFOS) chemistry," including 3M's MilSpec AFFF. Ex. 96. The EPA news release stated that the data 3M had supplied to EPA "indicated that these chemicals are very persistent in the environment, have a strong tendency to accumulate in human and animal tissues

and could potentially pose a risk to human health and the environment over the long term." *Id.* Following this announcement, DoD, EPA, and other agencies and governmental departments focused even more resources on investigating PFOS and PFOA, including these chemicals' use, role as possible degradation products of MilSpec AFFF, and potential human and environmental toxicity.

On August 2 and 3, 2000 (a few months after 3M's announcement), NRL's Navy Technology Center for Safety and Survivability hosted a "DOD AFFF Environmental Meeting" with personnel from the Army, Navy, Air Force, Marine Corps, FAA, and EPA in attendance. Ex. 97 at '842, '851–55. EPA's slide presentation indicated to the military EPA's view that PFOS presented a "*problem*" because it is persistent, bioaccumulating, and toxic. *Id.* at '937.

EPA considered PFOS toxic at high doses because, although it was "only moderately toxic via acute oral exposure," "serious effects" were seen in animals in "repeat oral dose subchronic and reproductive toxicity studies." *Id.* at '939. EPA considered PFOS "persistent" because it "is a very stable chemical that does not break down or degrade in the environment." *Id.* at '938. It considered PFOS "bioaccumulative" because "PFOS can build up over time; *its half-life in human blood is about 4 years*." *Id.* EPA told the attendees that PFOS was not an "imminent health risk" but that EPA had "serious concern for potential future risk to humans and wildlife if PFOS continues to be produced, released, [and] built up in the environment." *Id.* at '943. In addition, EPA's presentation directed DoD to EPA's Administrative Record file AR-226, which then contained hundreds of studies on the potential toxicity of PFOS and related chemistries, including "all health studies submitted on PFOS." *Id.* at '950.[11]

[11] As of December 2019, the index of AR-226, alone, had grown to 538 pages and contained nearly 4,000 entries from various sources of information. Ex. 98 (index to docket as of December 2019).

Facing the impending unavailability of 3M MilSpec AFFF for further purchases, the military focused on MilSpec AFFF manufactured by its other qualified suppliers. All of the remaining suppliers sourced fluorosurfactant chemicals made by an entirely different process from 3M's, called "telomerization." Ex. 57 at 4–6. Telomer-based MilSpec AFFF was not new; the military had qualified and used it continuously since 1973. Ex. 99 at 1–2.

In a memo dated October 2000, Doug Dierdorf, an Air Force toxicologist, recounted 3M's decision to exit the market and noted that "EPA is assessing the AFFF components used by other suppliers." Ex. 100, at 1. The memo added that "these alternate products degrade to produce compounds that are closely related to PFOS," the "primary degradation products of these AFFF compositions are [PFOA] and [PFDA]," and those compounds are "very persistent, and appear to be bio-accumulating and toxic." *Id.*

In February 2001, DoD invited groups from the military branches, EPA, FAA, and the National Fire Protection Association to attend an AFFF workshop to discuss the impact of an EPA proposed rule that DoD viewed with alarm as having the potential "to ban future production and importation" of PFOS. Ex. 101 at 1, 3. At the workshop, EPA reiterated to the military that PFOS is persistent, bioaccumulative, and toxic, and it remarked that PFOA and telomer-based AFFF "raise similar concerns." Ex. 102 at '052, '055. DoD viewed the situation with "panic[]" because a complete regulatory ban on the sale or use of PFOS- and/or PFOA-containing products would threaten DoD's ability to procure mission-critical AFFF. Ex. 16 (Bowling Dep.) 46:15–49:10.

In November 2002, EPA issued its "Draft Hazard Assessment of Perfluorooctanoic Acid (PFOA) and Its Salts," prepared by its Office of Pollution Prevention and Toxics. Ex. 103. The Draft Hazard Assessment characterized PFOA as persistent and potentially bioaccumulative and toxic. *Id.* Based on "[g]roundwater samples taken near fire-training areas that used fire-fighting

foams containing perfluorinated surfactants [that] had elevated PFOA concentrations many years after the foam use," EPA found that "(1) PFOA either existed in—or was formed via degradation of—the surfactants, (2) PFOA or its precursors migrate through the soil, and (3) PFOA persists in groundwater." *Id.* at 1. The military, in the meantime, continued to use its inventory of MilSpec AFFF that it knew contained PFOS and/or PFOA. *Compare* Ex. 104 (2004 AFFF inventory) *with* Ex. 105 (2011 AFFF inventory).

EPA's ongoing studies of PFOA resulted in its decision to work toward an end to all production and manufacturing emissions of the chemical. In January 2006, EPA contacted all major U.S. fluoropolymer and telomer manufacturers, requesting that they "join with EPA and other stakeholders to commit to a global stewardship program whose goal is to work toward essentially eliminating emissions and product content levels of PFOA and related chemicals." Ex. 106 at 1. EPA "recognize[d] that PFOA is persistent in the environment, that it has been detected in human blood, and that animal studies indicate effects of concern." *Id.* The request also characterized "PFOA and related chemicals" as "persistent, bioaccumulative, and toxic." *Id.* at 2. The proposed program's goal was to commit to (1) a 95% reduction in product content levels and facility emissions of PFOA and potential precursor chemicals by 2010 and (2) the elimination of direct production of PFOA and related chemicals by 2015. *Id.* at 1. The participating manufacturers agreed. In October 2006, that resulted in EPA's PFOA Stewardship Program. Ex. 107; Ex. 108.

Throughout this same period, DoD was acting in parallel to EPA. [redacted]

[redacted] Ex. 109 at i–ii; Ex. 110.[12] [redacted] Ex. 112 at '319. Participants discussed the presence of PFOA in AFFF that DoD purchased, the potential for human exposures, and the potential need to clean up fire training pits where AFFF was used. *Id.*

Even amidst all of this regulatory activity, the federal government imposed a requirement that large domestic airports, known as "Part 139" airports—which encompass all the major airports in the United States—purchase MilSpec AFFF beginning in July 2006. Ex. 113 (Part-139 Airport Certification Status List); Ex. 114. The FAA explained the requirement by reference to the same considerations that had driven the military's need for MilSpec AFFF—particularly the need for an agent that would reliably and efficiently control deadly fires at passenger airports. *See* Ex. 114; *see also* Ex. 115 (reiterating this requirement in September 2016).

In 2008, DoD wrote to the Army, Navy, Air Force, and Joint Chiefs of Staff that "PFOA is bio-persistent and has been found widely in blood samples from the general population," but emphasized that it "is used in the formulation of products critical to the [DoD]." Ex. 116 at 1. DoD noted that "suitable substitutes" for PFOA-containing AFFF were in development but not yet available. *Id.*

In January 2009, EPA publicly announced Provisional Health Advisories ("PHAs") for PFOA and PFOS in drinking water. Ex. 117 at 1. EPA described these PHAs as "reasonable, health-based hazard concentrations above which action should be taken to reduce exposure to unregulated contaminants in drinking water." *Id.* at 1 n.1. EPA's advisory levels for acceptable

[12] [redacted] Ex. 111 at 3. It is tasked with "endors[ing] the risk management options" related to impacts of chemicals that carry a potential risk to DoD. *Id.*

"short-term" consumption of drinking water were 400 parts per trillion for PFOA and 200 parts per trillion for PFOS. *Id.* at 4–5. These levels are equivalent to a few drops of PFOS/PFOA in an Olympic-sized swimming pool. Ex. 118 at 10.

Throughout this period, the military closely coordinated with EPA about PFAS, *see, e.g.*, Ex. 119; Ex. 101; Ex. 102; Ex. 97, and was aware of EPA's PHAs when EPA issued them in 2009. *See* Ex. 120 at 2. Later in 2009, the Department of Health and Human Services' Agency for Toxic Substances and Disease Registry ("ATSDR") issued a Draft Toxicological Profile for Perfluoroalkyls, which reported, among other things, that "two studies in workers found changes in sex hormones and cholesterol associated with the levels of PFOA in blood"; exposure to PFOA resulted in changes to the livers of laboratory animals; and "[f]eeding PFOA and PFOS to rats caused them to develop tumors." Ex. 121 at 4–5.

Notwithstanding all of the above information about the claimed environmental and human toxicities of PFOS and/or PFOA in MilSpec AFFF, DoD specifically advised its branches to continue to use the product. In 2011, DoD's Chemical & Material Risk Management Directorate issued a DoD-wide Chemical & Material Emerging Risk Alert for MilSpec AFFF, reiterating that "[s]ome legacy [MilSpec] AFFF formulations contain chemicals that present human health and environmental risks." Ex. 122 at 1, 3 (including "PFOS-based AFFF concentrate" and "long-chain telomer-based AFFF products"). In particular, DoD Alert advised that MilSpec AFFF contained PFOS and/or PFOA, which "bioaccumulate in the food chain, resist degradation, show evidence of toxicity in laboratory studies, and are the subject of increasing regulation worldwide." *Id.* It further noted that "sampling conducted at three DoD firefighting training areas showed concentrations of PFOS and PFOA in groundwater several orders of magnitude greater than the EPA PHA values." *Id.* at 2. But even with all this information, the DoD Alert advised that PFOS-

based AFFF from the military's inventory "can continue to be used in the United States," and that PFOA-containing AFFF remained on the DoD Qualified Products List and thus available for purchase and use. *Id.*

In May 2016, EPA replaced the 2009 PHAs with Lifetime Health Advisories for PFOS and PFOA in drinking water, setting the lifetime health advisory levels at 70 parts per trillion combined for PFOS and PFOA. Ex. 123 at 10; Ex. 124 at 9. These advisory levels remain in place today and, as described below, the military continued to allow the purchase and use of all types of AFFF after EPA issued them.

V. The military continued to use 3M MilSpec AFFF long after 3M's announced exit from the market and continues to purchase and use telomer-based MilSpec AFFF today.

As DoD described in its 2011 Risk Alert, Ex. 122, armed with decades of knowledge leading up to the 2009 EPA PHAs and ATSDR Draft Toxicological Profile, the military exercised its discretion to continue to purchase and use MilSpec AFFF that it knew contained PFOA, and to use 3M's PFOS-based MilSpec AFFF still in inventory, both in emergency fire situations and in training exercises. This embodied a classic risk-benefit judgment by the military, weighing the mission-critical nature of MilSpec AFFF against the potential risks of PFOS and PFOA to the environment and to people, including servicemembers. After balancing these competing considerations, DoD decided to continue to purchase and use these products.

A. The military continued to use 3M AFFF as late as 2018.

For years after 3M's 2000 announcement, DoD continued to purchase and use 3M's AFFF. *See, e.g.*, Ex. 119; Ex. 125. 3M continued to manufacture its AFFF products containing PFOS until the end of 2002, Ex. 126 at 1, and the military continued to purchase 3M's MilSpec AFFF through 2001, Ex. 127; *see also* Ex. 122 at 1; Ex. 128. In fact, at least one of 3M's PFOS-containing MilSpec AFFF products remained on the QPL (and therefore eligible for military

procurement, if a source could be found) *until 2010*. Ex. 99.

Estimates of the United States government's AFFF inventories developed by Robert Darwin (after leaving NAVSEA to work as a contractor) suggest that from 2004 to 2011 the government may have used about one million gallons of 3M AFFF. Ex. 105; *see also* Ex. 18 (Farley Dep.) 331:3–22. In 2011, two years after EPA issued its PHAs, DoD confirmed that "PFOS-based AFFF concentrate" remained in the military's inventory and advised that "PFOS-based AFFF can continue to be used in the United States." Ex. 122 at 1. Nor did EPA ever prohibit either military or civilian use of existing stocks of PFOS-containing AFFF. Ex. 119 at 1–2; Ex. 22 (Walker Dep.) 571:24–572:19; *see also* Ex. 22 (Walker Dep.) 538:19–539:12 (Air Force did not prohibit); Ex. 17 (Darwin Dep.) 168:14–169:1 (Navy did not prohibit).

In fact, the military did nothing to replace PFOS-based AFFF in its inventory until about December 2015, when DoD's ECGC met to discuss, in part, "risk management actions regarding fire-fighting foams." Ex. 129. The ECGC recommended that the military "remove & properly dispose of PFOS-based AFFF from the local stored supplies for non-shipboard use[,] . . . [and] [f]ocus on removing and replacing known PFOS-based AFFF in unopened drums/cans versus AFFF already loaded into system tanks/bladders[,]" and, referring to telomer-based AFFF, pointed out that "PFOS-free AFFF is available on the [QPL]." Ex. 130; *see also* Ex. 131 at 3–4.

But even then, the ECGC only recommended removing PFOS-based AFFF for "non-shipboard use." Ex. 130. As late as 2016, a DoD report noted that "significant amounts [of PFOS-based AFFF] remain in the inventory and continue to be used," and that "[t]he use of stockpiled PFOS-based AFFF [was] not restricted in the United States" at that time. Ex. 126 at 2. It was not until 2018 that the military set a policy to phase out (by 2020) its land-based use of PFOS-based AFFF. *See* Ex. 131 at 3–4. And to this day, the military has not prohibited off-shore use of PFOS-

based AFFF to the extent any remains on ships. *See* Ex. 130 (recommending phase out only for "non-shipboard use").

B. The military purchases and uses telomer-based AFFF today, knowing it still may contain PFOA or compounds that could degrade to PFOA.

Following 3M's withdrawal from the AFFF market in 2000 and the government's subsequent further examination of PFOA, the military decided to continue to purchase and use MilSpec AFFF that it knew contained PFOA and/or compounds that potentially degraded to PFOA. Ex. 122; Ex. 119. The military's inventories reflect this continued purchase and use. Ex. 132; Ex. 133; Ex. 126 at 4–10; Ex. 134. In 2016, DoD maintained in stock approximately 400,000 to 750,000 gallons of telomer-based MilSpec AFFF, not including AFFF that was intermixed in military storage or delivery systems with 3M's PFOS-based AFFF. Ex. 126 at iv–v.

In June 2018, DoD submitted a report to Congress on the military's plan to phase out its "legacy" MilSpec AFFF inventory, Ex. 131 at 2, 4, which would include phasing out "PFOS-based AFFF concentrate" and "long-chain telomer-based AFFF products." Ex. 122 at 1, 3. DoD reported to Congress that the Navy aimed to remove, replace, or dispose of legacy AFFF at the end of FY2020 (i.e., October 2020), and that the Army and Air Force would do so in 2019 and by the end of FY2019, respectively. Ex. 131 at 3–4. In other words, despite the government's (including the military's) decades of investigating and evaluating potential risks of PFOS and PFOA, some branches of the military did not plan to replace the "legacy" AFFF in stock until *last year*.

The military has expressed its clear-eyed rationale for continued use and purchase of MilSpec AFFF in scores of documents spanning several decades. *See, e.g.*, Ex. 135 at 9; Ex. 23 at 1; Ex. 50 at 5. As explained in the 1995 article co-written by Robert Darwin, then NAVSEA's Director of the Fire Protection Division, "[b]ecause [AFFF agents] can rapidly extinguish flammable liquid fires, they have undoubtedly saved lives, reduced property loss, and helped

minimize the global pollution that can result from the uncontrolled burning of flammable fuels, solvents, and industrial liquids." Ex. 95 at '662. More than two decades later, in 2016, James Podolske, the Air Force Fire Chief, emphasized that AFFF is an "integral part" of the Air Force's "toolbox" because it helps save lives, including the lives of Air Force firefighters, and protect property. Ex. 137 at 1. In 2016, Mark Correll, Deputy Assistant Secretary of the Air Force, echoed these comments, stating that "[f]rom an operational standpoint, we must use a [M]ilspec approved AFFF to protect people and property" and, given that the military must use MilSpec AFFF, "we want to move to reduce the 'environmental risk' associated with [AFFF] to [the] best extent we can." Ex. 72 at '836. In other words, Secretary Correll explained, by continuing to use and purchase MilSpec AFFF, the military was striking a balance between "operational risk" and "environmental risk." *See id.*

In short, multiple key military decisionmakers who were intimately connected to AFFF described the government's discretionary balance between, on the one hand, the potential environmental and health hazards associated with PFOS and PFOA, on the other hand, and continuing to purchase and use MilSpec AFFF because it is so critical to saving lives and protecting property. *See* Ex. 137 at 1; Ex. 95 at '662.

ARGUMENT

The undisputed facts establish, as a matter of law, that the government "approved reasonably precise specifications" for MilSpec AFFF under both of the "two routes" that the Fourth Circuit has articulated for satisfying the first *Boyle* element. *See Ramey v. Martin-Baker Aircraft Co.*, 874 F.2d 946, 950 (4th Cir. 1989) (analyzing *Boyle v. United Techs. Corp.*, 487 U.S. 500, 512 (1988)); *Tozer v. LTV Corp.*, 792 F.2d 403, 407–08 (4th Cir. 1986); *Dowd v. Textron Inc.*, 792 F.2d 409, 412 (4th Cir. 1986).

First, the AFFF MilSpec easily exceeds the bar set by *Tozer*, *Boyle*, and their progeny for

approval of "reasonably precise" specifications. The government not only "approved" but wrote, issued, updated, and enforced the precise specifications for MilSpec AFFF. Those specifications required "fluorocarbon surfactants" and also imposed rigorous requirements (including film formation, sealability, and fire performance) that mandated contractors' use of certain fluorocarbon surfactants capable of meeting those requirements. On its face, the AFFF MilSpec satisfies *Tozer*'s "reasonably precise" standard.

Second, under the *Dowd* test, Defendants are entitled to summary judgment on the first *Boyle* element because the uncontroverted evidence establishes that the federal government continued to purchase, use, and/or require the use of MilSpec AFFF containing PFOS and/or PFOA (or compounds that could break down to PFOS or PFOA) long after it knew of the putative hazards of the product.

I. The AFFF MilSpec is "reasonably precise" on its face.

A. The government approved reasonably precise specifications by writing, issuing, and overseeing a particularized MilSpec.

The first element of the GCD sets a low bar: The government need only "approve" a "reasonably precise" specification. *Boyle*, 487 U.S. at 512; *In re Agent Orange Prod. Liab. Litig.*, 517 F.3d 76, 90–91 (2d Cir. 2008). In the case of the AFFF MilSpec, the government did far more than simply "approve" it. Continuously since the 1960s, the government has actually written and updated the specification, which requires contractors to use fluorocarbon surfactants, and then has tested AFFF products and driven the development of more effective AFFF formulations. Thus, the required "genuine governmental participation in the design" of AFFF cannot reasonably be debated. *Tozer*, 792 F.2d at 408.

Courts have repeatedly held that the first *Boyle* element was met in cases in which the government itself issued a written specification containing numerous quantitative and qualitative

requirements for the product. For instance, in *Ramey*, the Fourth Circuit affirmed the trial court's grant of summary judgment to the defendant under the GCD, holding that *Boyle's* first element was satisfied where "[the] Navy issued the original design specifications" for the allegedly defective product; the Fourth Circuit explained that the GCD's first element is satisfied if government approval "consists of more than a mere rubber stamp," and concluded that the Navy's issuance of the relevant specifications easily met that test. 874 F.2d at 950. The Third Circuit in *Carley v. Wheeled Coach* likewise held the GCD's first element was met where "the government itself created and approved the specifications" for the product at issue. 991 F.2d 1117, 1125 (3d Cir. 1993); *see also Yeroshefsky v. Unisys Corp.*, 962 F. Supp. 710, 719–21 (D. Md. 1997).

The government exercised its discretion to draft and issue particularized specifications for MilSpec AFFF—including the critical design requirement that all AFFF must contain "fluorocarbon surfactants" (the allegedly defective component at issue in this litigation). The Navy has then administered and repeatedly modified the specifications for decades. *See* Common Undisputed Facts ("CUF") Section III. The MilSpec has imposed many other strict requirements that an AFFF product must meet, including the ability to form a film on a specific reference fuel, to extinguish fires within particular time limits, and to meet standards for toxicity and biodegradability. *See* CUF Sections III & IV.A. The MilSpec also sets forth specific testing and inspection procedures for determining that qualified AFFF products meet these requirements. *Id.* These requirements (including film-formation and strict performance parameters, among others) can be satisfied only by using certain types of fluorocarbon surfactants. Indeed, from the 2017 version through the present version, the MilSpec explicitly notes the government's approval of the presence of PFOA or PFOS in the product. *See* CUF Section III & IV.

The government's decades-long and continuous involvement with and oversight of

MilSpec AFFF satisfies *Boyle*'s first element, which requires only that the government do more than merely "rubber stamp" a product design. *Tozer*, 792 F.2d at 407–08; *see also Kleemann v. McDonnell Douglas Corp.*, 890 F.2d 698, 701 (4th Cir. 1989); *Tate v. Boeing Helicopters*, 55 F.3d 1150, 1154 (6th Cir. 1995); *Harduvel v. Gen. Dynamics Corp.*, 878 F.2d 1311, 1320 (11th Cir. 1989). By expressly requiring fluorocarbon surfactants in MilSpec AFFF and setting other parameters that necessarily mandated specific types of those chemicals, DoD exercised its discretion with even more precisions than in many other cases that satisfy the *Tozer* test—including *Tozer* itself. On this basis alone, the first element of *Boyle* is satisfied as a matter of law.

B. The AFFF MilSpec is "reasonably precise" without explicitly identifying the exact fluorocarbon surfactants to be used in its design.

Plaintiffs have contended that the AFFF MilSpec is not "reasonably precise" because (i) it does not specify the particular fluorocarbon surfactants that a contractor must use, and (ii) it is merely a "performance" specification. Both arguments fail.

First, the government need not specify a particular fluorocarbon surfactant in order for the MilSpec to be "reasonably precise" under *Boyle*. To the contrary, "general government approval of an overall design is sufficient," and the "defense can apply even where the manufacturer retains significant control over the design features in question." *Haltiwanger v. Unisys Corp.*, 949 F. Supp. 898, 902 (D.D.C. 1996); *see Yeroshefsky*, 962 F. Supp. at 718–19 ("reasonably precise specifications does not . . . mean that the government must exercise discretion with regard to the *specific* feature alleged to be defective"; "with regard to the first element under *Boyle*, a contractor need only show government approval of the *overall* design"); *Niemann v. McDonnell Douglas Corp.*, 721 F. Supp. 1019, 1027 (S.D. Ill. 1989) ("The first prong of the *Boyle* test . . . requires that the government approve the reasonably precise specifications for *the aircraft*, and not, as plaintiff argues, for each individual component of the aircraft."). In fact, the Supreme Court cautioned

against "penaliz[ing], and thus deter[ring], active contractor participation in the design process . . . ." *Boyle*, 487 U.S. at 513. This followed from the Fourth Circuit's description in *Boyle* decision below, that "Sikorksy and the Navy worked together to prepare detailed specifications for the CH–53 helicopter," including as to the allegedly defective escape hatch. *Boyle v. United Techs. Corp.*, 792 F.2d 413, 414–15 (4th Cir. 1986), *aff'd*, 487 U.S. 500 (1988). Thus, the government need not specify the exact fluorocarbon surfactant a contractor must use for the MilSpec to be "reasonably precise" under *Boyle*. *See, e.g.*, *Carley*, 991 F.2d at 1125 ("[T]he government need not deprive the manufacturer of all discretion pertaining to a particular design feature in order for the government contractor defense to apply."); *see also supra* p. 7 n.2.

The decision in *Gauthreaux v. United States*, 694 F. Supp. 2d 460 (E.D. Va. 2009), is instructive. In contrast to the government's particularized AFFF specifications, in *Gauthreaux* the specification *did not even mention* the allegedly defective design feature (a lack of rear and side view mirrors). *Id*. at 467. The court nevertheless applied Fourth Circuit precedent to hold that the manufacturer was protected by the GCD, explaining that the government's silence on this feature did "not mean that the United States approved imprecise or general guidelines, that it did not conduct a thorough review of the overall specifications, or that it left important design features" to the contractor. *Id.* What mattered was the specification's "reasonable precision" as a whole, not whether it contained a precise blueprint or even mentioned the allegedly defective component itself. The AFFF MilSpec even more clearly satisfies the "reasonably precise" standard because it requires the use of "fluorocarbon surfactants," the very product component about which Plaintiffs complain in this MDL.

The Ninth Circuit's decision in *Guerinot v. Rockwell International Corp.*, 923 F.2d 862, 1991 WL 4105 (9th Cir. 1991) (table), is also on point. There the plaintiff alleged that the

defendant's specific choice of loctite as a "locking agent" (an adhesive used to prevent fasteners from loosening) led to an accident. The plaintiff challenged the first element of the GCD because the Navy specification merely required the contractor to use a "locking agent," without "specifically requir[ing] the use of loctite as a locking agent." *Id.* at *4. The Ninth Circuit rejected the argument and affirmed summary judgment for the contractor on the GCD, holding that the defense applied because "the specifications state that an epoxy may be used as a locking agent," and the Navy never disapproved of using Loctite as an epoxy for the relevant product despite having "ample opportunity" to do so. *Id.*

The Ninth Circuit's holding would apply equally here, even if the MilSpec only required use of a "fluorocarbon surfactant" but left selection of a particular "fluorocarbon surfactant" entirely to the manufacturers. But the military did not leave this decision entirely to the manufacturers—as a practical matter, only certain fluorocarbon surfactants can meet all of the MilSpec requirements, including the requirement that MilSpec AFFF form a film over hydrocarbon fuels and meet the MilSpec's rigorous fire performance standards. *See* CUF Section III. The current AFFF MilSpec reflects the government's understanding that these particular fluorocarbon surfactants may contain PFOA or PFOS: Despite all the public controversy surrounding PFOA and PFOS, even today, the AFFF MilSpec permits the product to contain up to 800 ppb (800,000 ppt) of PFOS or PFOA.

Thus, the AFFF MilSpec is far more "reasonably precise" than the specifications at issue in cases like *Gauthreaux* or *Guerinot*. Not only does the MilSpec contain express design requirements, but it requires the precise design element Plaintiffs challenge—fluorocarbon surfactants—that the military acknowledges may contain some level of either PFOS or PFOA. *See, e.g.*, Ex. 13 (2020 MilSpec) § 6.6. The MilSpec's other requirements further constrained

contractors' design choices, limiting the universe of options to assure a final product that met the military's needs—as amply demonstrated by the fact that even today, no product without fluorocarbon surfactants meets the MilSpec.

Second, Plaintiffs' repeated assertion that the AFFF MilSpec is merely a "performance" specification is a red herring, for two reasons. First, the Navy's decision to *label* the AFFF MilSpec a "performance" specification does not mean that the MilSpec cannot satisfy *Boyle's* first element. Although it is true that military specifications must do more than merely identify a certain qualitative level of performance to satisfy the first element of *Boyle*, *see, e.g.*, *Getz*, 654 F.3d at 862, a mere label or characterization of a specification is immaterial. What matters are the specification's contents. *See, e.g.*, *id.* ("reject[ing] the notion that the approved specifications constitute mere performance criteria" because "the key specifications at issue pertain[ed] to the [product's] design"); *cf. Oliver*, 96 F.3d at 996–99; *Harduvel*, 878 F.2d at 1320. The AFFF MilSpec, on its face, does not merely specify performance requirements or otherwise leave the formulation of the product up to the manufacturers' unconstrained discretion. As Mr. Darwin agreed, regardless of the label used, the contents of the AFFF MilSpec show that it "required part of the design to be that it contained fluorocarbon surfactants." Ex. 17 (Darwin Dep.) 575:12–20.

Moreover, "[p]erformance requirements" themselves "can mandate a design choice" and thereby satisfy *Boyle*'s first element. *Kase v. Metalclad Insulation Corp.*, 212 Cal. Rptr. 3d 198, 212 (Cal. Ct. App. 2016). The Seventh Circuit made that clear in *Oliver v. Oshkosh Truck Corp.* There, the court held that the defendant had "satisfied the first element of the *Boyle* test" because the evidence showed that the Marine Corps had "exercised, through a detailed set of *performance and dimension* specifications, a considerable amount of substantive input into the *design* of the MK-48" at issue. 96 F.3d at 998 (emphases added). As the court explained, "[t]he Marine Corps

needed the MK-48 to have two seventy-five gallon fuel tanks; the ability to ford through five feet of water; the ability to restart a stalled engine while fording; the ability to fit into [a particular] shipping container; and the ability to be transported externally by helicopter." *Id.* at 999. "This combination of specifications," which included performance specifications, "*cabined significantly* the placement of the exhaust system and the fuel tanks"—the allegedly defective design feature—and for that reason those specifications satisfied the first element of *Boyle*. *Id.* (emphasis added). The AFFF MilSpec's requirements similarly combined to "cabin[] significantly" the manufacturer's choice of a suitable fluorocarbon surfactant. *Id*. Indeed, to this day, no qualified MilSpec AFFF has been manufactured without fluorocarbon surfactants that may contain or potentially degrade into either PFOS or PFOA.

The circumstances here are also like those in *Kase v. Metalclad Insulation Corp.*, which concerned the Navy's use of asbestos on submarines. 212 Cal. Rptr. 3d 198. The specification at issue did not explicitly call for asbestos-containing insulation, so the plaintiff argued that his injuries resulted from the contractor's independent choice to use "stock" insulation that "happen[ed] to" contain asbestos. *Id*. at 201, 207. The court rejected that argument, concluding that the contractor was immune under the GCD because the Navy made a "deliberative design choice" to issue a specification that "could only be met with, and thus required, asbestos-containing insulation." *Id.* at 213. In the present case, too, the particularized AFFF MilSpec sufficiently constrained the contractor's choice of a fluorocarbon surfactant such that *Boyle's* first element is met as a matter of law. *Ayo v. 3M Co.*, 2018 WL 4781145, at *10 (E.D.N.Y. Sept. 30, 2018) ("[T]he government approves reasonably precise specifications when it, among other things, issues performance requirements that significantly constrain the contractor's design choices." (citing *Oliver v. Oshkosh Truck Corp.*, 96 F.3d 992, 999 (7th Cir. 1996))). This is further

underscored by the impossibility (as the MilSpec now expressly acknowledges) of formulating MilSpec-compliant AFFF without "fluorocarbon surfactants" that may contain PFOS or PFOA, or compounds that could degrade into either PFOS or PFOA. Accordingly, as a matter of law, the MilSpec satisfies the first element of *Boyle*.

II. Under *Dowd*, the government's continued purchase and use of MilSpec AFFF also satisfies the first element of the GCD.

The AFFF MilSpec also independently satisfies the first *Boyle* element as a matter of law under the "continued use" doctrine, which the Fourth Circuit originated in *Dowd* and other courts have endorsed numerous times. *See Ramey*, 874 F.2d at 950–51; *Dowd*, 792 F.2d at 411–12; *see also Lewis*, 985 F.2d at 89 (when the government reordered the product at issue "[w]ith knowledge of its alleged design defect, the Government approved reasonably precise specifications for that product such that the manufacturer qualifies for the military contractor defense for any defects in the design of that product"); *In re Agent Orange Prod. Liab. Litig.*, 517 F.3d at 94–97; *Brinson v. Raytheon Co.*, 571 F.3d 1348, 1353 (11th Cir. 2009); *Gauthreaux*, 694 F. Supp. 2d at 467; *Kase*, 6 Cal. App. 5th at 641–42. As the Second Circuit explained in *Agent Orange*, "reordering the same product with knowledge of its relevant defects plays the identical role in the defense as listing specific ingredients, processes, or the like." *In re Agent Orange Prod. Liab. Litig.*, 517 F.3d at 94–95.

The government has long been aware of the feature of MilSpec AFFF's fluorocarbon surfactant component that gives rise to Plaintiffs' claims: namely, the presence of long-chain PFAS that may either contain or break down to form PFOA or PFOS. In fact, due to the mission-critical nature of MilSpec AFFF—and the essential role fluorocarbon surfactants play in making MilSpec AFFF work—there has been virtually *no time* over the last sixty years when the government was *not* studying MilSpec AFFF and/or its fluorocarbon surfactant components.

The government understood in the 1960s that MilSpec AFFF contained long-chain fluorocarbon surfactants that were chemically related to PFOS/PFOA, including the Navy identifying them as the preferred fluorosurfactants for AFFF in its 1963 patent application, and by extensively researching and developing the product. CUF Section II. From the 1970s on, the government thoroughly investigated MilSpec AFFF's biodegradability, including fluorocarbon surfactants' relative persistence, expected environmental impact, and treatability. CUF Section IV. Over the same period, the government also examined the toxicity of MilSpec AFFF generally and PFOS and PFOA specifically, including by analyzing impacts on marine life, laboratory animals, and humans. CUF Section IV.

Even with all this knowledge, the government has never ceased specifying, purchasing, and using MilSpec AFFF, determining that the military's need for it continues to outweigh these potential risks. As the then-MilSpec custodian Robert Darwin explained in 1995, "the fire safety advantages of using foam are greater than the risks of potential environmental problems." Ex. 95 at '663; *see also, e.g.*, Ex. 50 at 5 (1996 NRL report stating that "we will have to live with the fact that a small part of the AFFF concentrate is non-biodegradable"); Ex. 24 at '970 (2019 DoD comment to Senate Armed Services Committee).

Moreover, after 2000, when 3M announced it was exiting the AFFF market, multiple government agencies, including DoD, further analyzed the potential hazards of PFOS and PFOA that Plaintiffs allege in this litigation. By January 2009, all of the following events had already occurred: (1) 3M had stopped manufacturing PFOS-containing MilSpec AFFF; (2) EPA had declared PFOS to be persistent, bioaccumulative, and toxic; (3) EPA had characterized PFOA as persistent, bioaccumulative, and toxic; (4) EPA's PFOA Stewardship Program had committed fluorochemical manufacturing companies to phase out PFOA production by 2015; (5) DoD's

Emerging Chemicals of Concern Governance Council had noted that both PFOS and PFOA were present in MilSpec AFFF and in groundwater samples at certain DOD facilities; and (6) EPA had established PHAs for PFOA and PFOS in drinking water at the parts-per-trillion level. CUF Section IV.B.

By that time at the very latest, therefore, there can be no dispute that the military had, by any measure, the necessary relevant information about MilSpec AFFF, including its fluorocarbon surfactant components, the presence of PFOS and/or PFOA in those components (both historically and in current products), and the components' potential human health and environmental hazards. Yet, the military continued to make the discretionary decision to use PFOS-containing MilSpec AFFF through at least 2018—when the military began phasing out PFOS-based AFFF at land-based facilities. CUF Section V. The military also continued to purchase and use PFOA-containing AFFF, and even today—more than a decade after 2009—the government *still* uses and purchases MilSpec AFFF that contains some PFOA or chemicals that could degrade to PFOA. CUF Section V.

Comparing these facts to the leading cases on the "continuing use" doctrine, starting with *Dowd* itself, demonstrates that the AFFF MilSpec more than satisfies this test for *Boyle*'s first requirement. *Dowd* concerned a contract between the Army and the defendant, Bell, to design a helicopter. 792 F.2d at 410. During a training flight, a phenomenon known as "mast bumping" caused a fatal crash. *Id.* In response to plaintiffs' allegations of defective design, Bell presented evidence that the Army had investigated mast bumping several years after Bell originally designed the rotor system. *Id.* at 410–11. Affirming the trial court's grant of summary judgment to the manufacturer, the Fourth Circuit held that "[t]he length and breadth of the Army's experience with the [] rotor system—and its decision to continue using it—amply establish government approval

of the alleged design defects." *Id.* at 412; *see also Ramey*, 874 F.2d at 950.

Numerous other courts have followed the Fourth Circuit's lead. For example, as to the GCD, the Second Circuit's decision in *Agent Orange* is directly on point. In that case, the government had asked chemical manufacturers to produce an herbicide (Agent Orange) that was used during the Vietnam War; Vietnam veterans subsequently sued the manufacturers, alleging injuries from exposure to dioxin. 517 F.3d at 83. The plaintiffs argued that the manufacturers could not establish the first *Boyle* element because the military specified that the product use a chemical called 2,4,5-T but that in fact the product contained dioxin as an unintended byproduct of the manufacturing process. *Id*. at 88–89. According to plaintiffs, defendants could have made Agent Orange with dioxin-free 2,4,5-T that complied with the military's specifications. *Id*. at 89, 92. So too here, where the AFFF MilSpec required "fluorocarbon surfactants" but Plaintiffs claim that MilSpec AFFF is defective because it could have been made without particular fluorocarbon surfactants—long-chain PFAS or other PFAS that may contain or degrade into PFOS or PFOA.

The Second Circuit rejected the plaintiffs' arguments because the government over time had evaluated the alleged defect (dioxin in the product)—"examin[ing] its toxicity" and "determin[ing] that it posed no unacceptable hazard," *id*. at 95—and then continued to order Agent Orange in an "exercise of [its] discretion." *Id*. at 97. Based on those facts, the court held that, as a matter of law, the first *Boyle* element had been met. *Id.* at 95. Likewise, in the present case, the government repeatedly examined the toxicity and other potential risks of long-chain PFAS—including PFOA and PFOS—that it knew were in MilSpec AFFF and made the discretionary decision to continue ordering and using the product. As in *Agent Orange*, because the military continued to use AFFF containing PFOS or PFOA (or fluorocarbon surfactants that may degrade to those chemicals), the Court should not "'second-guess' the manufacturers' decision to produce

the agents in the manner that they did." *Id.* at 95 (quoting *Lewis*, 985 F.2d at 89).

Similarly, in *Lewis v. Babcock Industries*, the Second Circuit addressed whether the GCD "protects a contractor from whom the Government purchased replacement parts with knowledge of a design defect even if the Government had not previously approved specifications for the product with knowledge of the defect during the design phase." 985 F.2d at 84. Citing *Dowd*, the court held that it did. *Id.* In that case, the military contracted with General Dynamics to design the F-111 fighter jet. *Id.* After General Dynamics delivered the F–111 to the military, the Air Force became aware of a risk of corrosion on certain cables produced by Babcock Industries. *Id.* at 85. The Air Force completed an investigation of the problem and decided to reorder Babcock cables to replace the existing ones. *Id.* The plaintiff suffered injuries when one of the Babcock cables connecting the parachute system to his crew ejection module severed. *Id.* at 84.

The Second Circuit held that, "when the Government reordered the specific Babcock cable, with knowledge of its alleged design defect, the Government approved reasonably precise specifications for that product such that the manufacturer qualifies for the military contractor defense for any defects in the design of that product." *Id.* at 89. The same reasoning applies to the government's repeated discretionary decision to continue using and to replenish its stores of MilSpec AFFF, even understanding the product's potential risks.

In *Brinson v. Raytheon Co.*, the Eleventh Circuit likewise affirmed summary judgment on the GCD based on "post-design, post-production evidence as additional evidence to satisfy the first prong of the *Boyle* test." 571 F.3d at 1352, 1354–56. The contractor initially designed the T-6A, a training aircraft, for the military using a design the military approved. *Id.* at 1352. After the aircraft was in use, the military became "specifically aware of the design defect at issue," namely that certain flight control pushrods showed evidence of bending. *Id.* at 1355. Knowing this, the

military simply ordered that the "pushrods be replaced with new but identical Teflon-lined pushrods." *Id.* In other words, the military decided to continue purchasing the precise pushrod plaintiffs alleged to be defective. Relying in part on the Fourth Circuit's decision in *Dowd* and the Second Circuit's decision in *Lewis*, the Eleventh Circuit held that "[w]hen faced with a potentially failing or defective part, the military may make a discretionary decision concerning how to address the problem." *Id.* at 1353. If the government decides to keep using the product, courts should not "second-guess" that decision by allowing tort suits to proceed against contractors. *Id.*

The fundamental rule of law set forth in each of these cases—that *Boyle*'s first element is satisfied by the government's continued purchase or use of a product after the government knew of or considered the potential or alleged hazards of that product—applies to MilSpec AFFF just as much as or more than it applied to (1) the mast bumping in *Dowd*, (2) the dioxin in *Agent Orange*, (3) the cables in *Lewis*, (4) the flight-control pushrods in *Brinson*, or (5) the products at issue in the other cases applying this doctrine. *See, e.g.*, *Kase*, 212 Cal. Rptr. 3d at 212–13 ("The Navy's continued requisition of asbestos containing products in the face of extensive study as to asbestos's protective attributes, on the one hand, and its serious health risks, on the other hand, cannot be described as anything other than a deliberative judgment call—a quintessential discretionary function."); *Gauthreaux*, 694 F. Supp. 2d at 467.

Plaintiffs have argued that Defendants' position that PFOS and PFOA do not cause injuries at the levels found in the environment somehow undermines the GCD. But Government contractors need not confess liability or stipulate to a defect in their products to be eligible for the GCD. Rather, the GCD's continuing use doctrine applies so long as the government has investigated and become aware of the *potential* or *alleged* hazard that the plaintiff advances. That is why in none of the cases discussed above did the defendant contractor admit that its product was

defective or hazardous, and yet the courts granted summary judgment to defendants in all of them.

For example, in *Agent Orange*, the district court held that defendants were entitled to the GCD because, in part, the government was aware of the alleged human health hazards of the product and concluded that the available scientific evidence did not support a finding that Agent Orange actually caused disease. *In re Agent Orange Prod. Liab. Litig.*, 304 F. Supp. 2d 404, 407 (E.D.N.Y. 2004). The key question is thus, *assuming* the feature in question creates a hazard or defect, as plaintiffs allege, did the government know of that feature and the *potential* hazard it poses, yet continue to purchase or use the product? Here, as in *Agent Orange*, *Lewis*, *Brinson*, and other cases, the answer to that question is undeniably yes.

In fact, notwithstanding the controversy surrounding PFAS and even the long pendency of this litigation, just a few months ago, NRL's Director of Fire Test Operations stated that MilSpec AFFF remains the "gold standard agent" because of "its superior performance" and because "it's the best agent available to meet the fire protection needs" of the military. Ex. 18 (Farley Dep.) 161:23–162:3, 166:6–14. [redacted] Thus, MilSpec AFFF is still a critical piece of the military's arsenal "to put out fires, save the lives of service men and women, and protect property" on "military bases, airfields, and ships." *See* Ex. 15 Resp. 8.

Over the years, the federal government's consideration of the potential risks and benefits of MilSpec AFFF exemplifies its discretionary decision-making authority: Notwithstanding the

alleged risks, the government has continued to use and/or purchase MilSpec AFFF containing PFOS or PFOA given its unrivaled level of fire protection in service of the military's personnel and its critical missions. The government's discretionary decision to continue purchasing and using MilSpec AFFF after considering its potential hazards—even if (unlike here) there were no written military specification—satisfies *Boyle's* first element as a matter of law. *See Oliver*, 96 F.3d at 999 (affirming summary judgment on the GCD, holding that the "deliberate trade-off between military mission requirements and safety concerns . . . is at the heart of the government contractor defense"). The Court should reach the same result as in *Agent Orange*, *Dowd*, *Lewis*, *Brinson*, and other cases and hold that Defendants meet the first element of *Boyle* as a matter of law. "The length and breadth of the [government's] experience with [MilSpec AFFF]—and its decision to continue using it—amply establish government approval of the alleged design defects" that are the basis for Plaintiffs' claims in these cases. *Dowd*, 792 F.2d at 412.

CONCLUSION

Based on the two independent grounds set forth above, Defendants respectfully request that this Court hold that the AFFF MilSpec meets the first element of *Boyle* as a matter of law.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on November 5, 2021, I electronically filed the foregoing document with the Clerk of the Court using CM/ECF. I also certify the foregoing document is being served this day on all counsel of record in this case via transmission of Notice of Electronic Filing generated by CM/ECF.

/s/ David E. Dukes
David E. Dukes